(19)日本国特許庁（ＪＰ）　(12)公開特許公報（A）　(11)特許出願公開番号

特開平10－124936

(43)公開日　平成10年(1998)５月15日

| (51)Int.Cl.[6] | | 識別記号 | FI | | |
|---|---|---|---|---|---|
| G11B | 7/26 | 501 | G11B | 7/26 | 501 |
| | 7/00 | | | 7/00 | L |
| | 7/125 | | | 7/125 | C |

審査請求 有　請求項の数2　FD　（全 6 頁）

(21)出願番号　特願平8－291240

(22)出願日　平成８年(1996)10月15日

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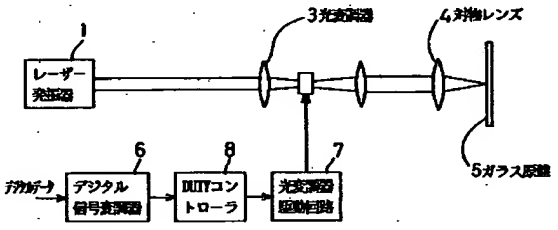
(54)【発明の名称】　ディスクのピット形状コントロール方法、及びディスク記録装置

(57)【要約】

【課題】　最適なピット形状を有するスタンパを製作するのにコントロールできるパラメータは、レーザパワー又は現像時間であるが、その他に制御できるパラメータを付加することによって、最適なピット形状を得やすくする。

【解決手段】　記録する変調されたデジタル信号のオン、オフの比を５０：５０から変化させる、すなわち、オン時のフォトレジストを塗布したガラス原盤への露光時間をコントロールすることで、ピット長さのみを変化させることができるから、レーザーパワーを小さく設定し、ピットのエッジをなだらかにして、ディスクの成形性を改良するなど、所望のピット形状を有するスタンパを得ることができる。



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【特許請求の範囲】

【請求項1】　フォトレジストを塗布した原盤にレーザー光をオン、オフして照射することでピットを形成し信号を記録するディスクの製造方法において、記録する変調されたデジタル信号のオン、オフの比を50：50から変化させ、オン時のフォトレジストを塗布したガラス原盤への露光時間をコントロールすることを特徴とするディスクのピット形状コントロール方法

【請求項2】　レーザー発振器と、レーザー発振器から出た光をオン、オフする光変調器と、記録するデジタル信号を変調するデジタル信号変調器と、変調されたデジタル信号のオン、オフのタイミングを所定量だけ変化させるデューティーコントローラと、デューティーコントローラからの出力信号に従って光変調器を駆動する光変調器駆動回路とを有し、記録する変調されたデジタル信号をデューティーコントローラによりオン、オフの比を50：50から変化させ、オン時のフォトレジストを塗布したガラス原盤への露光時間をコントロールすることを特徴とするディスク記録装置

【発明の詳細な説明】

【0001】

【産業上の利用分野】この発明は、ピットによりデジタル信号が記録されるディスクのピット形状コントロール方法、及び、ディスク記録装置に関するものである。

【0002】

【従来の技術】ディスクを製造する工程は、スタンパを作成するマスタリング工程と、そのスタンパからディスクを大量に複製するレプリケーション工程の二つに分けられる。マスタリング工程は、フォトレジストを塗布したガラス原盤表面をレーザ光で露光し、現像、導電膜処理、電鋳のステップを経てスタンパを製造する工程である。

【0003】従来の、レーザー光で露光する場合の一般的な構成を図6に示す。レーザー発振器11より出た光は光学レンズ12を通り、光変調器13でオンオフされ、その光はいくつかの光学素子を通った後対物レンズ14を通ってフォトレジストが塗布されたガラス原盤15に照射され、フォトレジストを露光する。一方、記録したいデジタルデータはデジタル変調器16で誤り訂正符号を付加するなどの変調をされた後、光変調器駆動回路17を通して光変調器13をオンオフ駆動する。光変調器13は変調された信号に従ってレーザー光をオンオフする。このようにして信号を記録した原盤15を現像処理することで、原盤表面に、変調したデジタル信号に対応するピットが形成される。この原盤15から電鋳などの適当な方法でディスクを成形する際の金型であるスタンパを製造し、さらにスタンパから射出成形などの適当な方法でディスクを大量に製造する。

【0004】

【発明が解決しようとする課題】原盤に形成されるピットは、正確には、変調されたデジタル信号から一定の誤差をもって形成される。これは、ピットの形状（特に長さ）がレーザー光のパワー、原盤の現像時間、フォトレジストの感光性能などにより変化するからで、これらの諸要因が完全にコントロールされれば、図8（b）に示すように、デジタル信号に完全に対応したピットが形成される。しかし、実際にはこのような完全なコントロールは不可能で、図8（a）に示すようにpだけ短いピットが形成されたり、同図（c）に示すようにqだけ長いピットが形成されたりする。このp、qのような「ずれ」をアシンメトリーという。アシンメトリーは記録したピットの長さにはあまり関係なく、どのような長さのピットでもほぼ同じ量だけ生じる。なお、図8において、T3及びT5は、ピット又はピットが形成されていない領域の長さを示している。

【0005】ピットの形状においては、図9の（a）（b）に示すように、エッジすなわちピットのへりの部分が垂直ではなく傾斜しており、したがってピットの概略形状はサッカースタジアムのような形をしている。アシンメトリー、及びエッジの角度はレーザーパワーやフォトレジストの現像時間により変化する。図9の（a）はレーザーパワーが大きい場合、（b）は小さい場合を示している。一般に、レーザーパワーが大きいとピットは長く、エッジは急峻となり、現像時間が長いとピットは長くなる。図7に、レーザーパワーとアシンメトリーの量の関係を示す。

【0006】従来、成形工程でスタンパより複製されたディスクを再生したとき、最良の電気特性を得るためには、すなわち最適なアシンメトリー得るためには、ガラス原盤に照射するレーザーパワーをコントロールするか、現像時間をコントロールするか、いずれかの方法を用いていた。しかし、レーザーパワー又は、現像時間をコントロールして、最適なアシンメトリーの値に合わせても、露光用レーザーのビーム径の大きさや、レーザービームの形状などの影響で、変調度などの他の必要な電気特性を満足するピットを有するスタンパを作ることができない場合があった。又、仮にできたとしても、ピットのエッジが急峻な為に、成形時にプローイング（PLOWING）を発生し、金型からの離型性が悪く、成形しにくいスタンパとなっていた。さらに、いたずらにレーザーパワーを強くしたり現像時間を長くすると形成されるピットの幅も広くなるから、記録密度の高いディスクには不都合を生じることとなる。

【0007】

【発明が解決しようとする課題】最適なピット形状を有するスタンパを製作するのにコントロールできるパラメータは、レーザパワー又は現像時間であるが、本願発明は、その他に制御できるパラメータ、すなわち、記録する変調されたデジタル信号のオンオフのタイミングの制御＝オン時のフォトレジストの露光時間のコントロール

を付加することによって、最適なピット形状を得やすくするものである。

【0008】

【課題を解決するための手段】本発明は、フォトレジストを塗布した原盤にレーザー光をオン、オフして照射することでピットを形成し信号を記録するディスクの製造方法において、記録する変調されたデジタル信号のオン、オフの比を50：50から変化させる、すなわち、オン時のフォトレジストを塗布したガラス原盤への露光時間をコントロールすることを特徴とするディスクのピット形状コントロール方法である。

【0009】また本発明は、レーザー発振器と、レーザー発振器から出た光をオン、オフする光変調器と、記録するデジタル信号を変調するデジタル信号変調器と、変調されたデジタル信号のオン、オフのタイミングを所定量だけ変化させるデューティーコントローラと、デューティーコントローラからの出力信号に従って光変調器を駆動する光変調器駆動回路とを有し、記録する変調されたデジタル信号をデューティーコントローラによりオン、オフの比を50：50から変化させる、すなわち、オン時のフォトレジストを塗布したガラス原盤への露光時間をコントロールすることを特徴とするディスク記録装置である。

【0010】光変調器を駆動する光変調器駆動回路に入力する変調されたデジタル信号のデューティーを変えること、換言すれば、ガラス原盤を露光する光のオンの時間を長くしたり短くすることと、従来のレーザパワーのコントロール又は、現像時間のコントロールを組合わせることによって、最適ピット形状が得やすくなる。例えば、図7に示すように、デジタル信号変調器の出力信号のデューティーが50：50の時、レーザパワーは、amw（ミリワット）で最適なアシンメトリが得られたが、ピットのエッジが急峻で成形性が悪い場合、以下の方法がある。レーザパワーをamwより小さくし、その代わりにレーザがオンになっている時間を長くする、すなわちデューティーを変えることによって最適なアシンメトリーは維持でき、かつ、ピットのエッジは、なだらかになり、成形性が良くなる。

【0011】光変調器駆動回路に入力する変調されたデジタル信号のデューティーを変えることは、図1に示すように、デジタル信号変調器と光変調器駆動回路の間にデューティーコントローラを挿入し、オン、オフの比を50：50から変化させることで実現される。

【0012】

【発明の実施の形態】デジタルビデオディスク（DVD＝商品名）において、8－16変調の後でデューティーを変え、最適ピット形状が得やすくなり、又、成形性の良いスタンパを得ることができた。他の用途には、コンパクトディスク（CD＝商品名）の8－14変調の後で同様のことが可能となる。

【0013】図1に本願発明の実施例のディスク記録装置の概略を示す。レーザー発振器1より出た光は光学レンズ2を通り、光変調器3でオンオフされ、その光はいくつかの光学素子を通った後対物レンズ4を通ってフォトレジストが塗布されたガラス原盤5に照射され、フォトレジストを露光する。この構成は従来のディスク記録装置と同じである。一方、記録したいデジタルデータはデジタル変調器6で誤り訂正符号を付加するなどの変調が行われた後、デューティーコントローラ8に入力される。デューティーコントローラ8は、図2に示すように、デジタル信号を制御するものである。図2のαは信号レベルH側（レーザー光オンの状態）の長さ、βは信号レベルL側（レーザー光オフの状態）の長さを意味し、（a）はコントロール前の信号、（b）はαを長くコントロール（レーザー光オンの状態を長くしピット長を長く）した出力信号、（c）はαを短くコントロール（レーザー光オンの状態を短くしピット長を短く）した出力信号を示している。デューティーコントローラ8からの出力信号は光変調器駆動回路7に送られ、前記のごとくコントロールされたデジタル信号に従って光変調器が作動し、レーザー光がオン、オフされる。

【0014】図3～5はデューティーコントローラ8の1例を示す説明図である。デューティーコントローラ8は、回路1（H側パルス短縮回路）と回路2（H側パルス拡大回路）とからなる。回路1はディレイラインとNANDとからなり、ピット側（信号レベルH側）のパルスを短くする（図4（b）参照）。回路2はディレイラインとデューティーセレクトスイッチとNANDからなり、該セレクトスイッチにより任意のパルス幅に拡大することができる（図4（c）参照）。したがって、デューティーコントローラ8により基本デジタル信号（実施例ではEFM変調されたデジタル信号）を図4（c）のセレクト範囲において自由にコントロールできる。

【0015】図5（A）は、ピット側のパルスを10ns（ナノセカント）拡大する例である。回路1のディレイラインによりパルスの立ち下がりを10ns遅らせる。回路1のディレイ量は10nsに固定されている。次に回路1のNANDによりパルスを反転する。回路1の出力は回路2のディレイラインに入力されるが、回路2は0～20nsの範囲でディレイ量をセレクトスイッチにより任意に変えることができ、この場合はディレイ量0とする。回路2のディレイ出力は回路2のNANDにより反転され、回路2のNAND出力は基本EMS信号に比べてピット側のパルスが10ns（ナノセカント）拡大されたものとなっている。

【0016】図5（B）は、デューティーのコントロール量を0とする例である。回路1でのディレイ出力及びNAND出力は（A）と同様であるが、回路2のディレイ量を10nsとし、その結果回路2のNAND出力はデューティーのコントロール量0となる。

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【0017】図5（C）は、ピット側のパルスを10ns（ナノセカント）短縮する例である。回路1でのディレイ出力及びNAND出力は、やはり（A）と同様であるが、回路2のディレイ量を20nsとし、その結果回路2のNAND出力は基本EMS信号に比べてピット側のパルスが10ns（ナノセカント）短縮されたものとなる。

【0018】本例のデューティーコントローラ8においては、回路1のディレイ量は10ns固定、回路2のディレイ量は0～20nsの範囲で2ns単位でセレクトできるから、デューティーコントローラのコントロール量は－10～＋10nsの範囲において2ns単位で設定できるものである。もちろん、デューティーコントローラの構成は本例に限るものではなく、パルス幅を任意にコントロールできるものであれば良い。

【0019】

【発明の効果】本発明によれば、ディスク製造過程におけるスタンパ製造時のコントロールパラメータが増え、ディスクの最適ピット形状が得やすくなる。また、デューティーをコントロールすることでピット長さのみを変化させることができるから、レーザーパワーを小さく設定することでピットのエッジをなだらかにすることができ、ディスクの成形性を改良することができる。

【図面の簡単な説明】

【図1】　実施例のディスク記録装置の説明図である。

【図2】　デューティーコントロルの説明図である。

【図3】　デューティーコントローラ8の説明図である。

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【図4】　デューティーコントローラ8の説明図である。

【図5】　デューティーコントローラ8の説明図である。

【図6】　従来のディスク記録装置の説明図である。

【図7】　アシンメトリーとレーザーパワーの関係を示す説明図である。

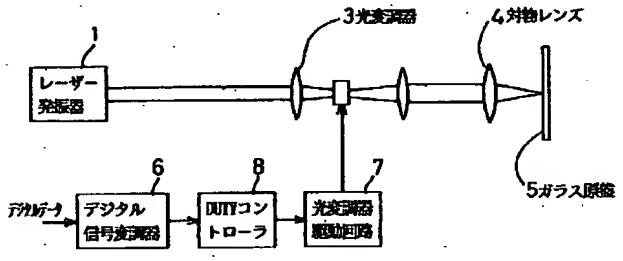
【図8】　アシンメトリーの概念の説明図である。

【図9】　レーザーパワーとピット形状の関係を示す説明図である。

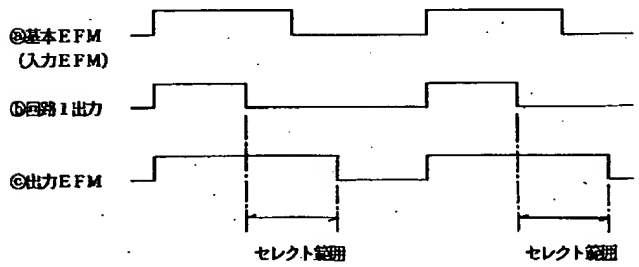
【符号の説明】

1　レーザー発振器
2　光学レンズ
3　光変調器
4　対物レンズ
5　ガラス原盤
6　デジタル信号変調器
7　光変調器駆動回路
8　デューティーコントローラ
11　レーザー発振器
12　光学レンズ
13　光変調器
14　対物レンズ
15　ガラス原盤
16　デジタル信号変調器
17　光変調器駆動回路

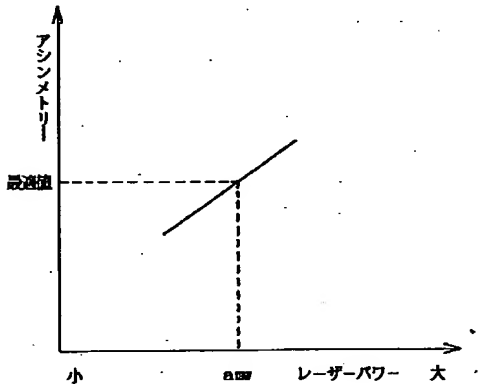
【図1】



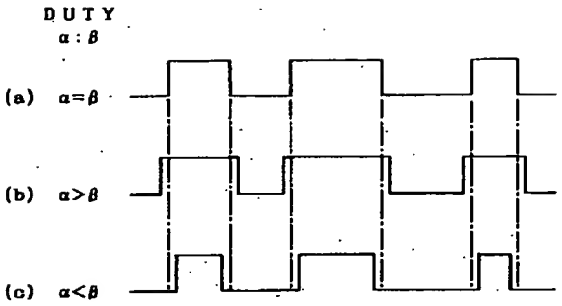

【図4】



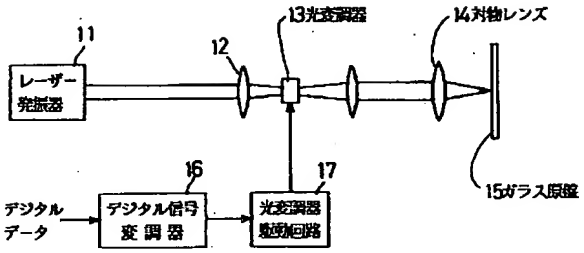

【図7】



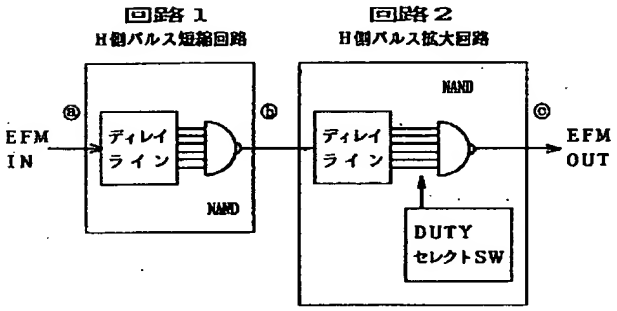
【図2】


DUTY
α：β
(a) α=β
(b) α>β
(c) α<β

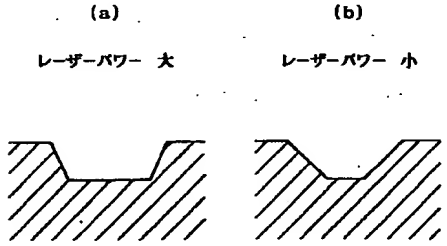
【図6】


11
12
13光変調器
14対物レンズ
レーザー発振器
16
17
15ガラス原盤
デジタルデータ
デジタル信号変調器
光変調器駆動回路

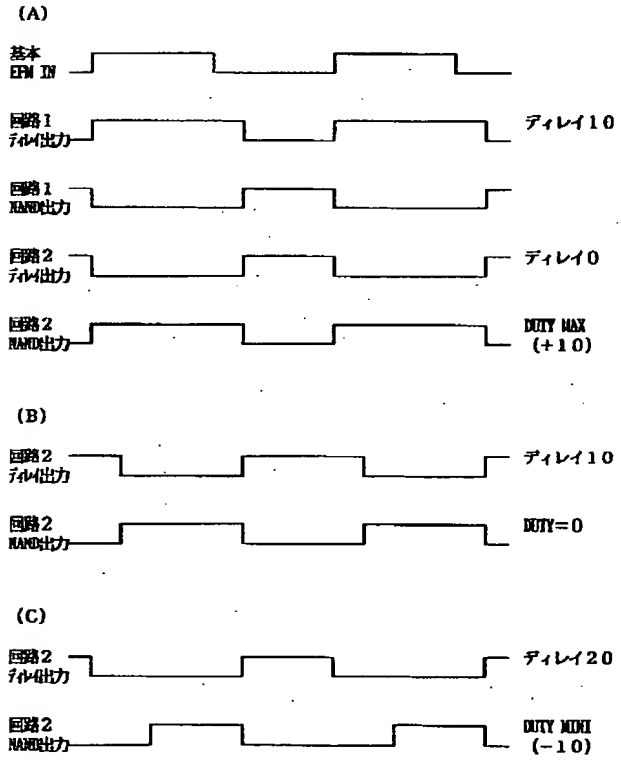
【図3】


回路1
H側パルス短縮回路
回路2
H側パルス拡大回路
EFM IN
ディレイライン
NAND
DUTY セレクトSW
EFM OUT

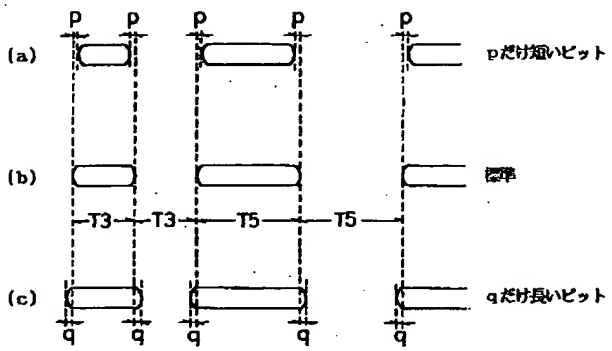
【図9】


(a)
(b)
レーザーパワー 大
レーザーパワー 小

【図5】


(A)
基本 EFM IN
回路1 ディレイ出力
ディレイ10
回路1 NAND出力
回路2 ディレイ出力
ディレイ0
回路2 NAND出力
DUTY MAX (+10)
(B)
回路2 ディレイ出力
ディレイ10
回路2 NAND出力
DUTY=0
(C)
回路2 ディレイ出力
ディレイ20
回路2 NAND出力
DUTY MINI (−10)

【図8】



# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-124936

(43)Date of publication of application : 15.05.1998

(51)Int.Cl. G11B 7/26
G11B 7/00
G11B 7/125

(21)Application number : 08-291240

(22)Date of filing : 15.10.1996

(71)Applicant : MEMORY TEC KK

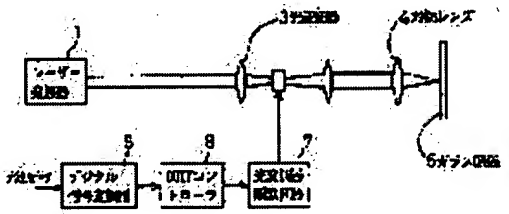
(72)Inventor : AZUMA RYOJI

## (54) DISK PIT SHAPE CONTROL METHOD AND DISK RECORDING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an optimal pit shape by controlling the on/off timing of a modulated digital signal to be recorded.

SOLUTION: Digital data to be recorded is modulated for adding an error correction code by a digital signal converter 6 and then a digital signal is controlled by a duty factor controller (DC) 8. A signal outputted from the DC 8 is used to actuate an optical modulator 3 by an optical modulator driving circuit 7 according to the controlled digital signal and a laser beam is turned on/off. The DC 8 is composed of an H side pulse reducing circuit and an H side pulse expanding circuit, the reducing circuit being for reducing a signal level H side pulse and the expanding circuit being for expanding the same to an optional pulse width by a select switch. Thus, a basic digital signal, in this case an EFM modulated digital signal, is freely controlled within a select range by the DC 8. Thus, the number of control parameters is increased for stamper manufacturing in a disk manufacturing process and optimal pit formation of a disk is facilitated.



LEGAL STATUS

[Date of request for examination] 19.11.1996

[Date of sending the examiner's decision of rejection] 10.11.1998

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *



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CLAIMS

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[Claim(s)]
[Claim 1] The pit configuration control approach [claim 2] of the disk characterized by to control the exposure time to the glass original recording which ON of the modulated digital signal to record and the ratio of OFF were changed from 50:50 in the manufacture approach of the disk which forms a pit by turning on laser light in the original recording which applied the photoresist, turning off in it, and irradiating it, and records a signal, and applied the photoresist at the time of ON A laser oscillation machine and the optical modulator which turns on the light which came out of the laser oscillation machine, and is turned off, The digital signal modulator which modulates the digital signal to record, and the duty controller to which only the specified quantity changes ON of the modulated digital signal, and the timing of OFF, It has the optical modulator drive circuit which drives an optical modulator according to the output signal from a duty controller. The disk recording device characterized by controlling the exposure time to the glass original recording which the modulated digital signal to record changed the ratio of ON and OFF from 50:50 by the duty controller, and applied the photoresist at the time of ON

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the pit configuration control approach and disk recording device of the disk with which a digital signal is recorded by the pit.
[0002]
[Description of the Prior Art] The process which manufactures a disk is divided into two, the mastering process which creates La Stampa, and the replication process which reproduces a disk in large quantities from the La Stampa. A mastering process is a process which exposes the glass original recording front face which applied the photoresist by the laser beam, and manufactures La Stampa through the step of development, an electric conduction membrane process, and electrocasting.
[0003] The general configuration in the case of exposing with the conventional laser light is shown in drawing 6 . The light which came out from the laser oscillation machine 11 passes along an optical lens 12, and is turned on and off with an optical modulator 13, and after the light passes along some optical elements, it is irradiated by the glass original recording 15 to which the photoresist was applied through the objective lens 14, and it exposes a photoresist. On the other hand, digital data to record carries out the on-off drive of the optical modulator 13 through the optical modulator drive circuit 17, after modulating adding an error correcting code with the digital modulation vessel 16 etc. An optical modulator 13 turns laser light on and off according to the modulated signal. Thus, by carrying out the development of the original recording 15 which recorded the signal, the pit corresponding to the modulated digital signal is formed in an original recording front face. La Stampa which is the metal mold at the time of fabricating a disk by suitable approaches, such as electrocasting, from this original recording 15 is manufactured, and a disk is further manufactured in large quantities by suitable approaches, such as injection molding, from La Stampa.
[0004]
[Problem(s) to be Solved by the Invention] The pit formed in original recording is correctly formed with a fixed error from the modulated digital signal. This is because the configuration (especially die length) of a pit changes with the power of laser light, the developing time of original recording, the photosensitive ability of a photoresist, etc., and if many of these factors are controlled completely, as shown in drawing 8 (b), the pit which corresponded to the digital signal completely will be formed. However, in fact, such perfect control is impossible, and the pit where only p is short is formed, or as shown in drawing 8 (a), as shown in this drawing (c), the pit where only q is long is formed. This "gap" like p and q is called asymmetry. Not much regardless of the die length of the recorded pit, asymmetry produces only the almost same amount in the pit of any die length. In addition, in drawing 8 , T3 and T5 show the die length of the field in which the pit or the pit is not formed.
[0005] In the configuration of a pit, as shown in (a) of drawing 9 , and (b), the part of an edge, i.e., the border of a pit, is not perpendicular, and it inclines, therefore the outline configuration of a pit has a form like a soccer stadium. Asymmetry and the include angle of an edge change with the developing time of laser power or a photoresist. As for (b), (a) of drawing 9 shows the case of being small, when

laser power is large. A pit will become long, if a pit is generally long when laser power is large, an edge becomes steep and developing time is long. The relation of the amount of laser power and asymmetry is shown in drawing 7 .

[0006] When the disk reproduced from La Stampa by the forming cycle is played conventionally, in order to acquire the best electrical property, the laser power which irradiates glass original recording was controlled to the optimal asymmetry **** sake, developing time was controlled to it, or one of approaches was used for it. However, there was a case where La Stampa which has the pit with which are satisfied of other required electrical properties, such as a modulation factor, could not be made from the effect of the magnitude of the beam diameter of the laser for exposure, the configuration of a laser beam, etc. even if it controls laser power or developing time and doubles with the value of the optimal asymmetry. Moreover, even if it could do, since the edge of a pit was steep, prow INGU (PLOWING) was generated at the time of shaping, and the mold-release characteristic from metal mold was bad, and had become La Stampa which is hard to fabricate. Furthermore, since the width of face of the pit which will be formed if laser power is strengthened in vain or developing time is lengthened also becomes large, un-arranging will be produced on a disk with high recording density.

[0007]

[Problem(s) to be Solved by the Invention] The invention in this application makes the optimal pit configuration easy to acquire by adding control of the exposure time of the photoresist at the time of control = ON of the timing of turning on and off of a parameter controllable in addition to this, i.e., the modulated digital signal to record, although a parameter controllable although La Stampa which has the optimal pit configuration is manufactured is laser power or developing time.

[0008]

[Means for Solving the Problem] This invention is the pit configuration control approach of the disk characterized by to change ON of the modulated digital signal to record, and the ratio of OFF from 50:50, namely, to control the exposure time to the glass original recording which applied the photoresist at the time of ON in the manufacture approach of the disk which forms a pit by turn on laser light in the original recording which applied the photoresist, turn off in it, and irradiate it, and records a signal.

[0009] Moreover, the optical modulator which this invention turns on the light which came out of the laser oscillation machine and the laser oscillation machine, and is turned off, The digital signal modulator which modulates the digital signal to record, and the duty controller to which only the specified quantity changes ON of the modulated digital signal, and the timing of OFF, It has the optical modulator drive circuit which drives an optical modulator according to the output signal from a duty controller. It is the disk recording device characterized by for the modulated digital signal to record changing the ratio of ON and OFF from 50:50 by the duty controller, namely, controlling the exposure time to the glass original recording which applied the photoresist at the time of ON.

[0010] It becomes easy to acquire the optimal pit configuration by lengthening changing the duty of the modulated digital signal which is inputted into the optical modulator drive circuit which drives an optical modulator, and time amount of ON of the light which will expose glass original recording if it puts in another way, or combining shortening, control of the conventional laser power, or control of developing time. For example, although the optimal asymmetry was obtained by amw (milli watt), laser power has the steep edge of a pit, and as shown in drawing 7 , when the duty of the output signal of a digital signal modulator is 50:50, when a moldability is bad, it has the following approaches. By lengthening time amount from which laser power is made smaller than amw, instead laser is turned on, namely, changing duty, the optimal asymmetry is maintainable, and the edge of a pit becomes gently-sloping and a moldability becomes good.

[0011] It realizes because changing the duty of the modulated digital signal which is inputted into an optical modulator drive circuit inserts a duty controller between a digital signal modulator and an optical modulator drive circuit and it changes the ratio of ON and OFF from 50:50, as shown in drawing 1 .

[0012]

[Embodiment of the Invention] In the digital videodisc (DVD= trade name), duty was changed after 8 - 16 modulation, and it becomes easy to acquire the optimal pit configuration, and La Stampa with a

sufficient moldability was able to be obtained. The same thing becomes possible after eight to 14 modulation of a compact disk (CD= trade name) at other applications.

[0013] The outline of the disk recording device of the example of the invention in this application is shown in drawing 1 . The light which came out from the laser oscillation machine 1 passes along an optical lens 2, and is turned on and off with an optical modulator 3, and after the light passes along some optical elements, it is irradiated by the glass original recording 5 to which the photoresist was applied through the objective lens 4, and it exposes a photoresist. This configuration is the same as the conventional disk recording device. On the other hand, digital data to record is inputted into the duty controller 8 after the modulation of adding an error correcting code with the digital modulation vessel 6 is performed. The duty controller 8 controls a digital signal to be shown in drawing 2 . alpha of drawing 2 means the die length by the side of signal level H (condition of laser light ON), and beta means the die length by the side of signal level L (condition of laser light OFF). The output signal with which (a) carried out the signal before control and (b) controlled alpha for a long time (the condition of laser light ON is lengthened and it is about pit length), and (c) show the output signal which controlled alpha short (the condition of laser light ON is shortened and it is about pit length). It is sent to the optical modulator drive circuit 7, and an optical modulator operates according to the digital signal controlled like the above, laser light is turned on and the output signal from the duty controller 8 is turned off.

[0014] Drawing 3 -5 are the explanatory view showing one example of the duty controller 8. The duty controller 8 consists of a circuit 1 (H side pulse compaction circuit) and a circuit 2 (H side pulse expansion circuit). A circuit 1 consists of a delay line and a NAND, and shortens the pulse by the side of a pit (signal level H side) (refer to drawing 4 (b)). A circuit 2 consists of a delay line, a duty select switch, and a NAND, and can be expanded to the pulse width of arbitration with this select switch (refer to drawing 4 (c)). Therefore, a basic digital signal (digital signal by which eight-to-fourteen modulation was carried out in the example) is freely controllable in the selection range of drawing 4 (c) by the duty controller 8.

[0015] Drawing 5 (A) is an example which carries out expansion of the pulse by the side of a pit for 10ns (nano secant). Falling of a pulse is delayed for 10ns by the delay line of a circuit 1. The amount of delay of a circuit 1 is being fixed to 10ns. Next, a pulse is reversed by NAND of a circuit 1. Although the output of a circuit 1 is inputted into the delay line of a circuit 2, a circuit 2 can change the amount of delay into arbitration with a select switch in the range for 0 - 20ns, and makes it the amount 0 of delay in this case. The delay output of a circuit 2 was reversed by NAND of a circuit 2, and the pulse by the side of a pit had carried out expansion of the NAND output of a circuit 2 for 10ns (nano secant) compared with the basic EMS signal.

[0016] Drawing 5 (B) is an example which sets the amount of control of duty to 0. Although the delay output and NAND output in a circuit 1 are the same as that of (A), the amount of delay of a circuit 2 is set to 10ns, and, as a result, the NAND output of a circuit 2 serves as the amount 0 of control of duty.

[0017] Drawing 5 (C) is an example which carries out compaction of the pulse by the side of a pit for 10ns (nano secant). Although the delay output and NAND output in a circuit 1 were the same as that of (A) too, the amount of delay of a circuit 2 was set to 20ns, and, as a result, the pulse by the side of a pit carried out compaction of the NAND output of a circuit 2 for 10ns (nano secant) compared with the basic EMS signal.

[0018] In the duty controller 8 of this example, since the amount of delay of a circuit 1 can select immobilization and the amount of delay of a circuit 2 per 2ns in the range for 0 - 20ns for 10ns, the amount of control of a duty controller can be set up per 2ns in the range for -10 - +10ns. Of course, the configuration of a duty controller is not restricted to this example, and just controls pulse width to arbitration.

[0019]

[Effect of the Invention] According to this invention, the control parameter at the time of the La Stampa manufacture in a disk manufacture process increases, and it becomes easy to acquire the optimal pit configuration of a disk. Moreover, since only pit die length can be changed by controlling duty, the edge of a pit can be made gently-sloping by setting up laser power small, and the moldability of a disk can be

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]
[Drawing 1] It is the explanatory view of the disk recording device of an example.
[Drawing 2] It is the explanatory view of duty KONTORORU.
[Drawing 3] It is the explanatory view of the duty controller 8.
[Drawing 4] It is the explanatory view of the duty controller 8.
[Drawing 5] It is the explanatory view of the duty controller 8.
[Drawing 6] It is the explanatory view of the conventional disk recording device.
[Drawing 7] It is the explanatory view showing asymmetry and the relation of laser power.
[Drawing 8] It is the explanatory view of the concept of asymmetry.
[Drawing 9] It is the explanatory view showing the relation between laser power and a pit configuration.

[Description of Notations]
1 Laser Oscillation Machine
2 Optical Lens
3 Optical Modulator
4 Objective Lens
5 Glass Original Recording
6 Digital Signal Modulator
7 Optical Modulator Drive Circuit
8 Duty Controller
11 Laser Oscillation Machine
12 Optical Lens
13 Optical Modulator
14 Objective Lens
15 Glass Original Recording
16 Digital Signal Modulator
17 Optical Modulator Drive Circuit

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[Translation done.]

DERWENT-ACC-NO: 1998-338650

DERWENT-WEEK: 199830



TITLE: Pit shape control method e.g. for disk - involves controlling exposure time of original disk coated with photoresist during ON period of light signal based on which length of pit formed on disk is varied

PATENT-ASSIGNEE: MEMORY TECH KK[MEMON]

PRIORITY-DATA: 1996JP-0291240 (October 15, 1996)

PATENT-FAMILY:

| PUB-NO | PUB-DATE | LANGUAGE | PAGES | MAIN-IPC |
|---|---|---|---|---|
| JP 10124936 A | May 15, 1998 | N/A | 006 | G11B 007/26 |

APPLICATION-DATA:

| PUB-NO | APPL-DESCRIPTOR | APPL-NO | APPL-DATE |
|---|---|---|---|
| **JP 10124936A** | N/A | 1996JP-0291240 | October 15, 1996 |

INT-CL (IPC): G11B007/00, G11B007/125 , G11B007/26

ABSTRACTED-PUB-NO: JP 10124936A

BASIC-ABSTRACT:

The method involves varying the ratio of ON and OFF of light signal emitted from laser oscillator (1) from a standard ratio 50:50. The exposure time of a original disk (5) coated with a photoresist is then controlled during ON period based on which length of a pit formed on the disk is varied. The optimum pit shape is thus obtained.

ADVANTAGE - Obtains optimum pit shape easily.

CHOSEN-DRAWING: Dwg.1/9

DERWENT-CLASS: T03 W04

EPI-CODES: T03-B01D1; T03-B01E3E; T03-B01F5; W04-C01E; W04-C01F;